



From  
the People of Japan



ADB TA-9993 THA: Climate Change Adaptation in Agriculture for Enhanced Recovery and Sustainability of Highlands

# Alternative Livelihood Options for Highland Communities



**AIT**  
Asian Institute of Technology







# TA 9993-THA: Climate Change Adaptation in Agriculture for Enhanced Recovery and Sustainability of Highlands

## Knowledge Product

Alternative Livelihood Options for Highland Communities

August 2024





**Project Name:** Climate Change Adaptation in Agriculture for Enhanced Recovery and Sustainability of Highlands

**Project No.:** TA 9993-THA

**Recipient:** Asian Development Bank (ADB) and Office of Agricultural Economics (OAE)

**Document Type:** Knowledge Product-KP4

**Title:** Alternative Livelihood Options for Highland Communities

**Version:** 4

**Date:** 19 August 2024

**Contributing Authors:** Siriluck Sirisup

This Consultant's report does not necessarily reflect the views of ADB, or the Government concerned, and ADB and the Government cannot be held liable for its contents.

## Foreword

These short stories are prepared in contrast to theoretical aspects and center around practical field applications and experiences of Climate-Smart Agriculture (CSA). The major target audience is policymakers and small-scale farmers, with the purposes of (1) encouraging policymakers to support small-scale farmers to implement CSA and (2) encouraging the majority of small-scale farmers to practice CSA.

Each of the six stories draws inspiration from real-life CSA practices implemented in the highlands of northern Thailand, with two stories originating from Phayao Province and the remaining four from Bua Yai Subdistrict in Nan Province. The stories from Phayao help demonstrate the alternative livelihood choices made by highland farmers in the eight provinces of the upper northern region of Thailand, which are encompassed in the broad focus area of the TA.

Three of the six cases have diversified from individual conventional farming practices with heavy chemical use to an alternative option of chemical-free farming by using available natural materials and resources together with knowledge to improve their productivity, the environment, and their livelihoods. These alternatives have brought the farmers success and satisfaction. The beekeeping case reflects the alternative adaptation option of harmonizing with the environment while generating good returns. The other two cases of sesame and traditional weaving are alternatives that are suitable for older people and women.

The first case revolves around the "Success of Sustainable Agriculture Practice Following Sufficiency Economy Approach" narrative in Phayao province. It highlights the effective transition from traditional farming involving monocropping and high-cost chemical inputs to sustainable agriculture practices. This transition was guided by the "New Theory of King Rama IX" – a self-reliance principle known as the Sufficiency Economy Philosophy. Such practices have allowed communities to break free from the iterative and chronic cycle of debt. The adaptation of mixed cropping and efficient use of local resources have drastically reduced input costs, eliminated marketing difficulties, and boosted income, consequently liberating farmers from household debt traps while simultaneously improving their environment and reducing carbon emissions. Women's empowerment in this context has been instrumental in generating household income and ensuring food security and safety. Applying these practices through training has notably improved the practitioners' economic and environmental living conditions. The narratives shed light on the many beneficiaries who have adopted diverse CSA practices and sustainable agriculture following their training.

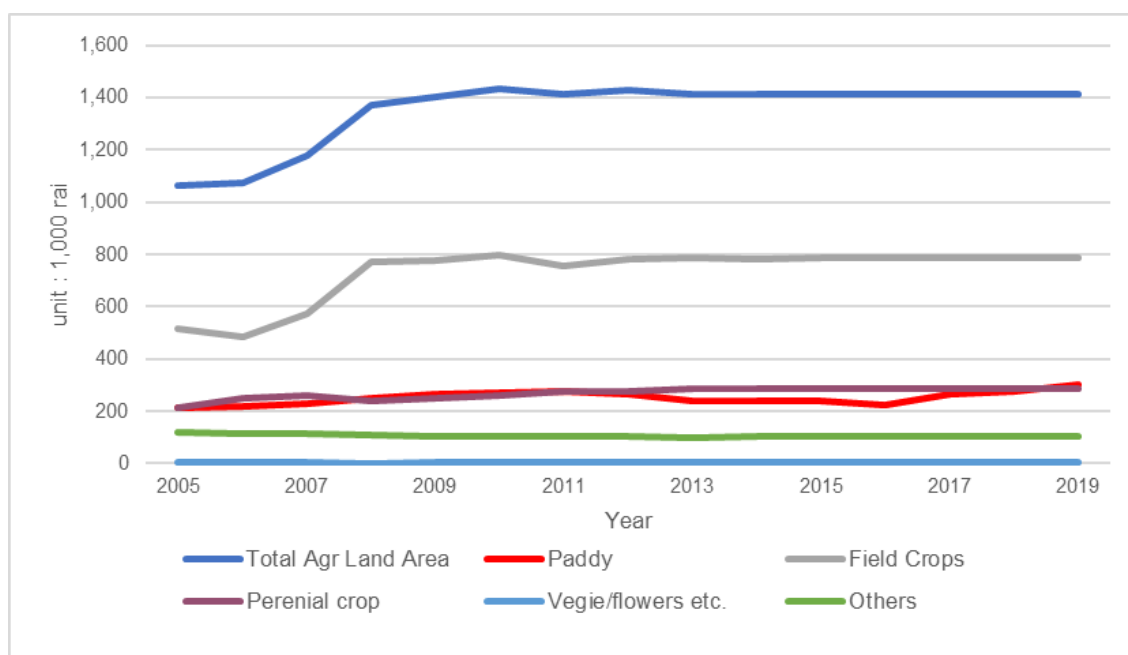
The second case study, "Practicing of Integrated Organic Farming by Mr. Jamnong Nackpradub," at Ban Toon Subdistrict, Muang District, Phayao Province, makes a note of Mr. Jamnong's successful shift to organic farming despite having no prior farming experience. The 1997 economic crisis forced him to abandon his previous business and venture into farming. His success is largely attributable to soil enhancement through bio-composting and strategic land use planning based on area suitability and market demands. This practice has resulted in fertile soil, improved crops, and reduced carbon emissions and input costs. A reliable year-round supply to the local market contributes to the sustainability of the home economy. It has also inspired other farmers to adopt similar methods.

These two cases in Phayao are good examples to demonstrate how the success of sustainable agriculture practices enables the enlargement of the number of small-scale farmers to follow them. Details in each case show that the followers are happy due to obtaining better income security, having sufficient and safe food, and living in a friendly environment. During the COVID-19 pandemic, the farmers in these two cases had sufficient and safe food despite quarantine regulations. They were relying on their own home-grown food.

The four case studies from Nan Province highlight the adaptation of two crops and two options for alternative livelihoods. Both pumpkin and sesame crops are area-appropriate for local climate change adaptation, require minimal labor, and are drought-resistant. Beekeeping is also an area-appropriate and environmentally friendly alternative livelihood option. Moreover, the empowerment of indigenous knowledge and technical assistance promoting traditional weaving improves the livelihoods and well-being of local women, especially the elderly.

Nan Province is characterized by mountainous terrain with limited flat, arable land, and the majority of land cover is forest. Enlarging of maize cultivation is correlated with the decline of forest area in Nan over time, from 856,246 to 500,439 ha in 2012 and down to 470,469.7 in 2021, a 41.5% reduction from 1995-2012 and nearly 6% from 2012-2021. Most of this lost forest (92%) has been converted into crop (mainly maize) fields by 2017. This leads to deteriorating soils and soil erosion, as well as the extensive application and subsequent leaching of agrichemicals, which contaminates critical water sources. Monoculture farming practices, especially maize production, have increased household debt burdens, as indicated by the debt-to-income ratio reaching 0.89 in 2013<sup>1</sup>. Increased chronic debt coupled with deteriorating soil fertility represents a potent combination, imposing escalating environmental and household monetary costs associated with farm expansion/encroachment and production costs.

The loss of forest area is correlated with increased agricultural land, which increased by about 51.5% (from 342,997 to 518,257 ha) from 1995-2012. The total agricultural area in Nan increased rapidly from 2006 to 2008 but not much from 2008 to 2019. Rice cultivation area increased during 2005-2011 but declined during 2011-2016 and increased again during 2016-2019<sup>2</sup>. The rubber plantation area increased from 2011-2019, while the maize cultivation area increased during 2011-2015 but declined during 2016-2019. Cassava cultivation area in the province increased nearly threefold in one year between 2019-2020, except Na Noi District<sup>3</sup>.

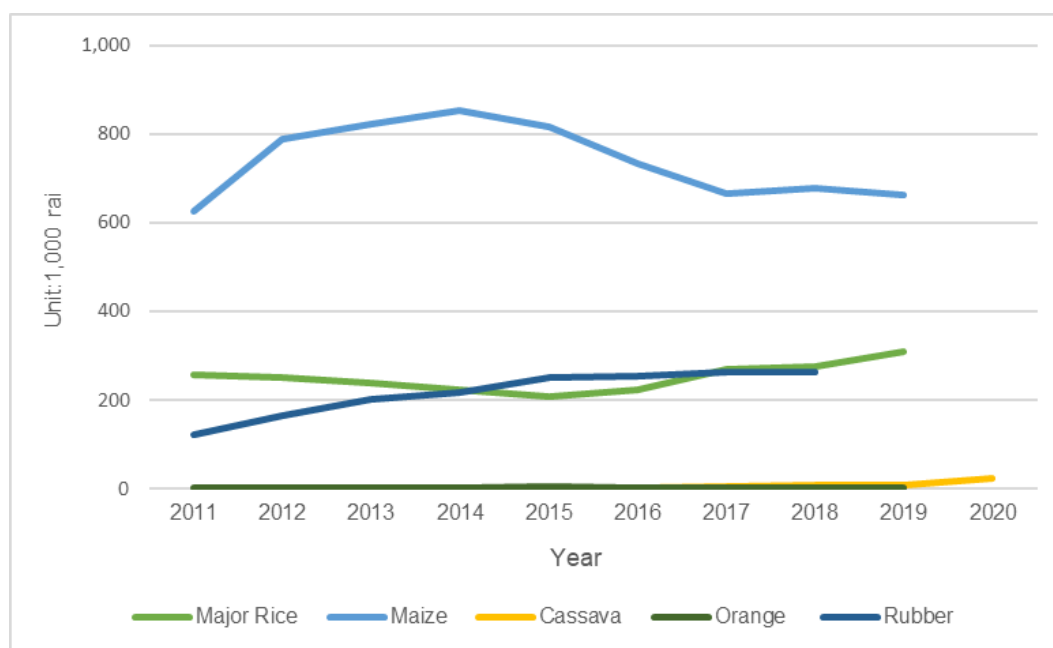


**Agricultural land use in Nan**

<sup>1</sup> Kitichaicharoen, J., Suebpongsang, P., Sangchyoswat, C., & Promburom, P. (2015). Situational analysis in support of the development of integrated agricultural systems in the upland areas of Nan Province, Thailand. Situational analysis in support of the development of integrated agricultural systems in the upland areas of Nan province, Thailand.

<sup>2</sup> <http://www.oae.go.th>: Land use statistic by province during 2005-2019

<sup>3</sup> <http://www.oae.go.th>: Statistic of specific crops during 2011-2019



**Cultivation area of various crops in Nan**

Agricultural land in Nan represents 27.6%<sup>4</sup> of the total province and is the main income source for Nan's population. They are involved in crop cultivation, comprising rice farming, field crops, and orchards, while only 0.01% engage in livestock raising and fish culture<sup>5</sup>.

The average annual income per capita of Nan was 68,407 Baht. The income of Na Noi people was higher than that, at 72,578 Baht/person/year. The highest income was in Muang district, at 81,644.85 Baht/person/year. The annual average expense per person at the provincial level was 43,865.42 Baht. The highest expense was in the Na Noi district, at 57,379 Baht/person/year. Generally, the average annual expense was lower than the average annual income in every district of Nan Province. At the provincial level, 947 households, or 0.56% of total households, had income lower than 38,000 Baht/person/year<sup>6</sup>. This number in Na Noi district is higher, at 130 households or 1.14% of the district. Nan households are relatively wealthy. This is reflected in the small number of low-income people<sup>7</sup>. Furthermore, the Poverty level in Nan province has been declining in recent years, from 212,700 (46.4%) in 2000 to 94,499 (21%) in 2012 and 35,949 or 10.97% in 2022<sup>8</sup>.

The situation in Bua Yai is similar. According to the baseline survey, the cash crops of Bua Yai villagers are maize and rubber. The subsistence rice crop is grown in a small area of low land, mainly for home consumption. Despite the existence of 38 types of cropping systems in Bua Yai, it is dominated by a monocropping system, followed by a double cropping system. Rubber production is the most common crop for mono-cropping households, followed by maize, while rice is cultivated in a small area due to the limitation of lowlands. The combination of maize and rubber was the most common two-crop system. The combination of 3 crops, 4 crops, and 5 crops are in a smaller number. Pumpkin and sesame are included in these combinations. Various fruit trees such as banana, mango, coconut, tamarind, etc., and kitchen gardens are commonly grown at homesteads and farm sites<sup>9</sup>.

<sup>4</sup> Source: Nan Land Development Office 7, 2021

<sup>5</sup> Nan Provincial Community Development Office, socio-economic conditions of Nan people 2019 (in Thai)

<sup>6</sup> According to Basic Minimum Need Indicator of Community Development Department, household which has income lower than 38,000 Baht/person/year is categorized as low-income family.

<sup>7</sup> Nan Provincial Community Development Office, socio-economic conditions of Nan people 2019 (in Thai)

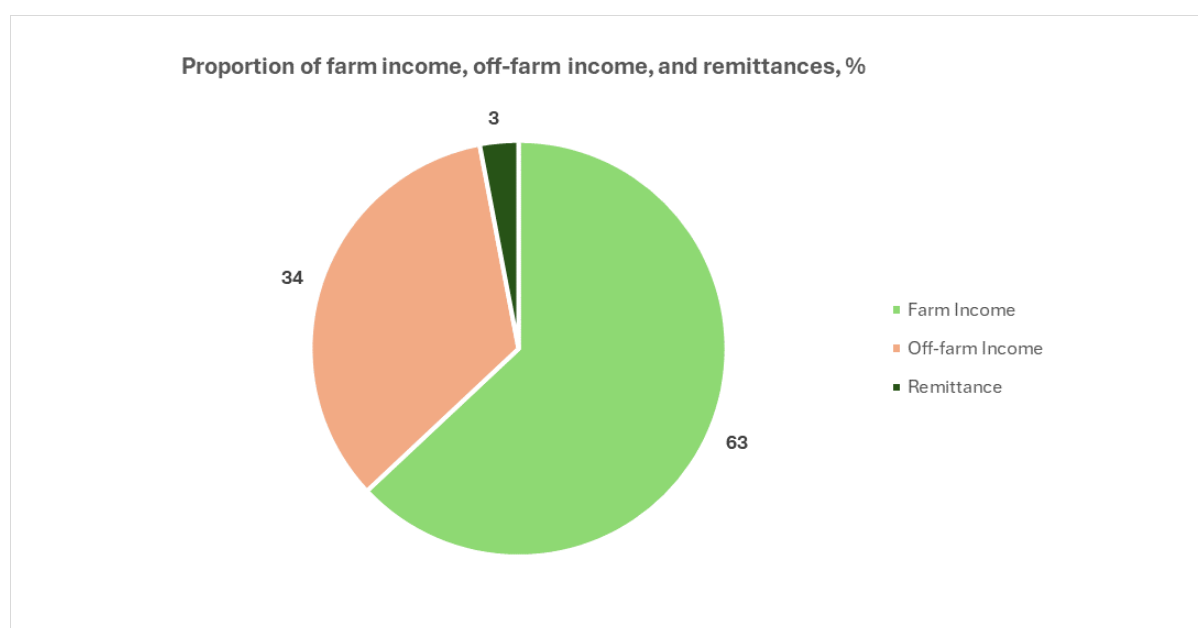
<sup>8</sup> Source: Thai People Map and Analytics Platform (TPMAP), quoted by the nation, THURSDAY, FEBRUARY 17, 2022

<sup>9</sup> Source: Data derived from the baseline survey, conducted by the TA in December 2021

Hence, the largest portion of total household income was from farm income (about 63%), followed by about 34% from off-farm sources and about 3% from the money sent back home from other family members (see Table 1 and Figure 3).

Sources	Amount (Thai Bhat)		
	Total	Average per household	%
Off-farm income	26,671,860	83,350	34
Remittance	2,072,395	6,476	3
Farm income	50,208,635	156,902	63
<b>Total</b>	<b>78,952,890</b>	<b>246,728</b>	<b>100</b>

**Total and average income of respondents**



Source: Data derived from the baseline survey, December 2021

Farm income is derived from various activities, but mostly from crop cultivation of rubber and maize. Apart from the cash and subsistence rice crop, pumpkin is a well-known crop in Nan, including Bua Yai. Especially the native variety of “Khainoa” is an identity of Nan's native pumpkin. The villagers grow this crop in a small area or at the edge of the farm site, normally in the late rainy season, as this crop doesn't require as much water as rice. Furthermore, organic pumpkins can be sold at a higher price than those that use chemical inputs.

This is a kind of alternative crop to the maize of Ms. Vanrien Tuinoi. She diverted 7 out of the 25 rai of land from maize to pumpkin while keeping the rest of the area for cash crops of rubber plantation. Her case study demonstrates how implementing “Good Agricultural Practices – GAP” can lead to a higher market price than conventional, chemical-dependent methods while reducing carbon emissions with more friendly environmental and health safety<sup>10</sup>. However, the narrative underscores the necessity for an efficient value chain to manage large volume supply. The success of this case hinges on robust market connections and support for value addition.

The sesame case study presents a different perspective. Cultivating sesame is straightforward, requiring low input costs, minimal use of herbicides, and less labor while promising good market returns. In addition to being drought-resistant, the distinctive hairy pods of sesame protect the crop from potential damage from unexpected rainfall during harvest. This makes sesame appealing to older farmers seeking to implement CSA practices with reduced risk and reliable profit margins.

<sup>10</sup> Economic analysis of conventional practice of maize and alternative of pumpkin cultivation is compared in her case.



The case study shows it is a worthy alternative for the elderly as they can do something rather than being alone and having nothing to do at home.

While working on the farm, the farmers in Bua Yai found that they could spend the time on beekeeping without hindering the major farm activities as they are simple, has very low input cost, is less time-consuming, and is not dependent on chemical use, while having a good market value. Currently, more than 30 families in Bua Yai have adopted beekeeping as an alternative to supplement their major income, which is mainly derived from maize and rubber. The case demonstrates the benefits of a simple and sustainable practice that can contribute to the well-being of rural communities. Beekeeping is a low-cost and low-impact livelihood activity that can provide a source of income, dietary contribution, traditional medicinal value, and environmental benefits without carbon emission. The practice is closely linked to the well-being of the environment, making it a resilient and sustainable income-generating activity. The security of honey production during the dry season is especially worth an alternative to that of rainfed farmers of Bua Yai.

As mentioned earlier, off-farm income, which includes traditional hand weaving, contributes to about one-third of total household income. This activity is particularly beneficial for women, many of whom are elderly and have retired from farm work, while others engage in it during less busy periods of housework or farming. They can earn more from this activity. The revenue is worth in comparison to its input cost.

Weaving also reflects women's empowerment through indigenous knowledge, with technical and marketing support. The practice not only provides a source of income for elderly women but also allows them to spend their time in a productive and enjoyable way, which is crucial for the overall well-being of an aging society. Weaving together at the center makes them happier than being alone at home. With no engine use, hand weaving is an environmentally friendly practice with no carbon emission concerns.

Cloth weaving was significantly impacted during the COVID-19 pandemic in 2021-2022. With most people staying home and going out less frequently, orders dwindled, and many weavers, including the group chairperson, contracted the virus. Sales of woven products plummeted by around 90% from 2021 to mid-2022. The situation began to improve from July 2022 onward. However, the pandemic had little effect on agriculture, as the peak farming season occurs during the dry months of April and May when there is typically no farm activity.

Between 2020-2021, nine persons from a total of 3,973 population in Bua Yai were infected by COVID-19 (0.22%). Its infection rate was higher in 2022. The number was 567 or 14.27% from January to July 2022<sup>11</sup>. This is similar to the infection rate in Nan and the other provinces in Thailand. As of March 2022, 6,947 cases of COVID-19 were reported for Nan Province, or 1.45% of the Nan Province population (478,227 people). Consistent with other Provinces in Thailand, daily cases increased substantially in January-February 2022<sup>12</sup>.

The treatment of COVID-19 in the rural area is the same throughout the country. In Bua Yai, the infected villagers reported to the Village Health Volunteer and were investigated by the COVID-19 responsive Section of the district hospital in Na Noi. Serious cases were admitted to the hospital, while non-serious ones got consultation and medical delivery at home. All infected persons and their families were quarantined at home. They were mostly reliant on family, and they were also supported by their neighbors. A small number had access to government assistance. There was minimally restricted school attendance among Bua Yai children<sup>13</sup>.

<sup>11</sup> Source: Bua Yai Subdistrict Health Promotion Hospital

<sup>12</sup> Department of Disease Control (Ministry of Public Health) <https://ddc.moph.go.th/covid19-dashboard/?dashboard=select-trend-line> accessed March 2022

<sup>13</sup> Source: Bua Yai Subdistrict Health Promotion Hospital, Director of Ban Oi Community School, Village 1 of Bua Yai and focus group discussion with 13 infected persons in July 2022, and socio-economic baseline survey conducted by the TA in December 2021

# Contents

<b>Foreword</b>	<b>i</b>
<b>Figures</b>	<b>vii</b>
<b>Abbreviations</b>	<b>ix</b>
<b>Conversions</b>	<b>ix</b>
<b>1. The Learning Centre for Living Following the Sufficiency Economy Approach</b>	<b>10</b>
1.1 Background	10
1.2 Turning Point	10
1.3 Success Stories	17
1.4 Conclusion	20
<b>2. Integrated Organic Farming at the Learning Centre of Mr. Jamnong Nackpradub</b>	<b>21</b>
2.1 Background	21
2.2 Turning Point	21
2.3 Success Stories	27
2.4 Conclusion	28
<b>3. Good Agricultural Practices of Pumpkin</b>	<b>29</b>
3.1 Background	29
3.2 Turning Point	29
3.3 Conclusion	33
<b>4. Sesame – Crops for the Elderly</b>	<b>36</b>
4.1 Background	36
4.2 Turning Point	36
4.3 Conclusion	39
<b>5. Beekeeping</b>	<b>40</b>
5.1 Background	40
5.2 Turning Point	40
5.3 Approach to Sustainable Beekeeping	43
5.4 Conclusion	43
<b>6. Traditional Weaving</b>	<b>44</b>
6.1 Background	44
6.2 Turning Point	45
6.3 Beneficiaries	46
6.4 Conclusion	47
<b>7. Conclusion</b>	<b>48</b>

# Figures

Figure 1: The Learning Centre and the key resource personnel.	10
Figure 2: Making compost from organic materials (left) and applying them to the vegetables (right).	11
Figure 3: Terrace farming of rice (left) and growing different kinds of vegetables (right).	11
Figure 4: (A) Tangerines; (B) White mugwort; (C) Sweet tea vine; and (D) Sweet wormwood herb.	12
Figure 5: (A) Fish farming; (B) Pig rearing; (C) Preparation of pig feed; and (D) Bio-pesticide made from local plants.	13
Figure 6: Training workshops at the Learning Centre.	14
Figure 7: Making salted eggs.	15
Figure 8: (A), (B) Fish processing; (C) Salted pork preparation; and (D) Preserved bamboo shoots.	16
Figure 9: Products Made and Sold by Mr. Kanya	17
Figure 10: Tea roasting by Ms. Yupin – the Hmong hill tribe woman, and her products packaged and sold at the center.	18
Figure 11: (Left) Cow rearing, the major income source of Ms. Sunan, and (Right) Cutting maize stems to prepare cow feed.	19
Figure 12: (A) Chicken and paddy, mainly for home consumption; (B) Cattle – a major source of income and compost; (C) Coffee plant; (D) Simple roasted coffee; and (E) Roasted and ground coffee for sale.	20
Figure 13: Making compost from biomaterials.	21
Figure 14: Planting different vegetables at different times of the year.	22
Figure 15: (A) Strawberry farming plot; (B) Mixed fruit plantation; and (C) Rambutan plantation.	23
Figure 16: Picking strawberries from the farm.	23
Figure 17: (A) Guavas; (B) Santols; and (C) Selling rambutan at the farm.	24
Figure 18: (Above) Vegetables sold at Phayao Hospital, and (Below) Ms. Kanika, a regular customer at the hospital market.	25
Figure 19: (Above) The learning center at Mr. Jamnong’s farm, and (Below) Training farmers on land use planning.	26
Figure 20: Ms. Supaporn Phayayam.	27
Figure 21: Mr. Jamnong and his wife working in the strawberry plantation plot.	27
Figure 22: The Community Organic Agriculture Enterprise of Bua Yai.	29
Figure 23: (Left) Ms. Vanrien’s husband preparing land for seedlings, and (Right) Ms. Vanrien working in her pumpkin plot.	30
Figure 24: (A) Transporting pumpkins to the collection center; (B) Pumpkin pile at the collection center; (C) Transporting pumpkins from areas outside of Bua Yai; (D) Ms. Vanrien and her	

certified pumpkins; (E) Pumpkin sale at Bua Yai; and (F) Selling pumpkins and other vegetables at a local market in Na Noi.	32
Figure 25: Mrs. Thikamporn Kongsorn.	33
Figure 26: Mrs. Thikamporn Kongsorn, women group representative for Bua Yai Subdistrict.	33
Figure 27: (A) Pumpkin with organic certification; (B) Device to make pumpkin paste (C) Selling pumpkins at Makro Supermarket; (D) Processing facilities supported by Central Group; and (E), (F) Pumpkin cakes on sale.	34
Figure 28: (A) Pumpkin cookies; (B) Crispy pumpkin; (C) Pumpkin powder; (D) Pumpkin toffee; (E) Coffee-infused pumpkin seeds; and (F) Pumpkin seed oil.	35
Figure 29: (A) Sesame plant nearly ready for harvesting; (B) White sesame; and (C) Black sesame.	37
Figure 30: (A) Threshing the sesame; (B) White sesame grains; (C) Weighing the grains; and (D) Sesame seeds packaged and ready for sale.	38
Figure 31: (A) Mrs. Boonnong and (B) Mr. Art, both content with working on sesame cultivation at an advanced age.	39
Figure 32: Mr. Nattachai and his small apiary.	40
Figure 33: Mr. Waen places a beehive under his small rice barn.	41
Figure 34: Honey produced at Mr. Nattachai's apiary.	41
Figure 35: (Top left) Beehive with bees; (bottom left) products stored at Mr. Nattachai's home; (top right) bees collecting nectar from wildflowers; and (bottom right) source of wildflowers in the forest.	42
Figure 36: (Left) Honey on display at organic market in Bua Yai; (top right) Honey products on display and sale at organic market at Bua Yai Subdistrict Administrative Organization; (middle right) label created by Mr. Waen's daughter; and (bottom right) placing the labels on honey bottles.	43
Figure 37: Baan Nong Ha Women Weaving Group.	44
Figure 38: Mrs. Sai-ngern Kaewkantha, chairperson of the group.	44
Figure 39: (Top left and top right) Clothing for women and men, and shawls; (bottom left) dyed yarn from local plants; and (bottom right) simple foot loom made by the village men.	45
Figure 40: Pha Lai Nam Lai - Watermark Flow – the Classical Northern Design, by Mrs. Sai-ngern.	46
Figure 41: Pha Lai Nam Lai - Watermark Flow, by Mrs. Pongkham.	46
Figure 42: Mrs. Porn weaving a “Sao Din” Design.	47
Figure 43: (Top) Mrs. Somthawin setting the yarn; (bottom left) Mrs. Jamnien weaving with natural cotton and natural colors; and (bottom right) ready-made shawls by Mrs. Somthawin.	47

# Abbreviations

<b>ADB</b>	Asian Development Bank
<b>AIT</b>	Asian Institute of Technology
<b>COVID-19</b>	Coronavirus Disease-19
<b>CSA</b>	Climate-Smart Agriculture
<b>GAP</b>	Good Agricultural Practices
<b>MOAC</b>	Ministry of Agriculture and Cooperatives
<b>MOI</b>	Ministry of Interior
<b>PGS</b>	Participatory Guarantee System
<b>THA</b>	Thailand

# Conversions

1 rai = 0.16 hectare

1 USD = 35 Baht

# 1. The Learning Centre for Living Following the Sufficiency Economy Approach

Mae Ka Subdistrict, Mueang District, Phayao Province

## 1.1 Background

Over the span of 15 years (2006-2023 in the Gregorian calendar and 2549-2566 in the Thai calendar), more than 10,000 farmers were trained in sustainable agriculture practices. The practical training followed the guidance of the "New Theory of King Rama IX" - the sufficiency economy principle, organized by "The Learning Centre for Living Following Sufficiency Economy Approach" in northern Thailand's Phayao Province. The center was established in 2007 with support from the Ministry of Agriculture and Cooperative (MOAC). It is located in the highland area of Mae Ka Subdistrict and is run by a community enterprise.

Two key resource personnel at the center are Manote, a man from Mae Ka village, and a local woman—Ms. Kanya (Figure 1). Manote was a conventional farmer who, like many in Thailand, faced crippling debt due to low earnings from his monocropped rice farming.

*"The turning point to enable uplifting our livelihoods and pay off debt – to be out of the vicious circle was the practice of sustainable agriculture, following the 'New Theory of King Rama IX' - the sufficiency economy principle based on self-reliance practice."*

## 1.2 Turning Point

However, the turning point came when Manote began practicing sustainable agriculture, based on the "New Theory of King Rama IX" – the sufficiency economy principle. After being trained by the Village Foundation, he diversified his farming to integrate crops and livestock instead of relying solely on rice.

**Figure 1:**  
The Learning Centre and the key resource personnel.



His newly adopted practices involve the circular utilization of farm resources and environmentally friendly methods. Manote found that most of the expenses were from farm inputs and food, so he and his wife began producing these with the materials available on their farm. They transformed their monocropped rice field into an integrated farming system, using compost from crop residues, soil, and pig manure, and created pesticides from local plants. This practice improved soil and decreased the need for chemical fertilizers and pesticides (Figure 2).

**Figure 2:**  
Making compost from organic materials (left) and applying them to the vegetables (right).



**Figure 3:**  
Terrace farming of rice (left) and growing different kinds of vegetables (right).



Their cropping system included the cultivation of crops for both consumption and selling. They primarily grew rice and various vegetables for home consumption (Figure 3), selling any surplus for cash. To earn money, they grew tangerines and a specific vegetable - White mugwort (*Artemisia lactiflora*). These organic products were in high demand, which helped generate a good cash flow thanks to reliable market demand.

They grow various herbs at home that can prevent, control, and suppress various illnesses. These herbs could be boiled, steamed, or used as cooking ingredients. Examples of these herbs are sweet tea vine and sweet wormwood herbs. The sweet tea vine (*Gynostemma pentaphyllum* (Thunb.)) is a medicinal plant known for enhancing longevity by lowering cholesterol and blood pressure. This plant naturally grows among the weeds. The sweet wormwood herb (*Artemisia annua* L.) is a key ingredient in traditional Thai aromatic medicine used to strengthen the heart. It has been suggested as an effective agent for suppressing COVID-19 (Figure 4).

**Figure 4:**

(A) Tangerines; (B) White mugwort; (C) Sweet tea vine; and (D) Sweet wormwood herb.



(A)



(B)



(C)



(D)



They have also introduced livestock farming into their sustainable agriculture practices, raising fish, pigs, and chickens. The crops and livestock residues are mainly used to produce compost and create a micro-circular economy aided by local resources. The residues also became animal and fish feeds combined with maize cob, other grains, and banana stems. A bio-pesticide produced from a mixture of fermented local herbs and sold in the local market (Figure 5).

**Figure 5:**

(A) Fish farming; (B) Pig rearing; (C) Preparation of pig feed; and (D) Bio-pesticide made from local plants.



After over a decade of practicing integrated farming and circular resource utilization, Manote and his family live a happy, debt-free life with improved health from their safe, home-grown food. The successful transformation of their farming practices and lifestyle has motivated them to share their knowledge and establish a community enterprise.



**Figure 6:**  
Training workshops at the Learning Centre.

Training at the center emphasizes the importance of self-reliance practices and using local resources over purchased chemical inputs. This approach has encouraged many farmers to adopt sustainable agriculture and uplift their livelihoods, including empowering women. Consequently, it has gained recognition from various agricultural and community development agencies, primarily within the mandate of the Ministry of Agricultural Cooperatives (MOAC) and the Ministry of Interior (MOI) (Figure 6).

Ms. Kanya Khuenkaew, one of the trainees, was also caught in the chronic cycle of debt. Her expenses were higher than her income from her daily wage job. After receiving training and adopting sustainable agriculture based on the principle of self-reliance, she successfully reduced and finally eliminated her debt obligations. She now enjoys a life with food safety and security. As she learned more, she found that women played a significant role in food, nutrition, and family health. Gradually, she developed her skills as a resource person to promote "woman empowerment" in these areas.

She shares her knowledge of empowering women, highlighting the important responsibilities women have at the household level. She stresses their major roles in food, finance, and health. She emphasizes that women must analyze the household economy to understand their financial situation. She created a form to record expenses that lists necessary and unnecessary items. In the case of overspending, she recommends reducing spending on unnecessary and harmful items such as monosodium glutamate, soft drinks, whiskey, mobile phones, etc.

**Figure 7:**  
Making salted eggs.



Noting the record of food items and medicine correlates with various crops (i.e., vegetables, protein sources such as chicken and fish, and some herbs), she advises trainees to cultivate them based on self-reliance practices. She points out that women play a crucial role in preparing these items for consumption, and recognizing their value can lower household expenses. They can also ensure food security and safety while generating cash from any surplus. This can be especially true when some items can be further processed for value addition, such as making preserved salted eggs

from organic duck eggs with particular herbs, drying fish, making salted pork, preserving vegetables, and using pig manure for fertilizer (Figure 7 and Figure 8).

**Figure 8:**

(A), (B) Fish processing; (C) Salted pork preparation; and (D) Preserved bamboo shoots.



(A)



(B)



(C)



(D)

## Existing Situation

Diversifying from monocropping to sustainable agriculture makes Mr. Manote and Ms. Kanya busy with their farming and related activities. Manote and his wife spend their time mostly farming, comprising crop cultivation of orchards, vegetables, and herbs, making compost, bio-pesticide, biochar, and marketing his farm products. Despite being busy with the existing situation, he and his wife are happy with this situation due to living in a friendly environment with no chemical concerns, sustainable income all year round from products, and lower expenses of farm inputs and household items. They sell farm products and farm inputs such as compost, bio-pesticide, and biochar. The price of his organic products is at least about 50% higher than those of conventional products. For them, earnings from agriculture account for about 90% of total income, while input cost is only about 10%. Moreover, producing food at home not only improves their financial situation but also provides food security and safety. With this experience, he is engaged as a resource person to transfer practical knowledge at "The Learning Centre for Living Following Sufficiency Economy Approach." This generates about 10% of his total income.

Similarly, Ms. Kanya earns about 15% of her total income from being the particular trainer on "women empowerment" at the training center with the subjects described earlier. Her daily life is spent mostly on the value addition of farm and natural products and farming activities. These activities generate about 85% of total income, whereas its input cost is about 20%. The major earnings are from selling processed products such as salted eggs, herbal tea, fertilizer, sesame oil ... etc. These are displayed and sold at her place (Figure 9).

**Figure 9:**  
Products Made and Sold by Mr. Kanya



### 1.3 Success Stories

Over half of the more than 10,000 trainees at the center are women. Many of them have found success in implementing the practices they learned during training. For example, Ms. Yupin Vareenyom, a 68-year-old Hmong hill tribe woman from village 7, Pha Chang Noi Subdistrict, Pong District, Phayao Province, has successfully added value to her tea after training at the center. She has increased her income by using indigenous tea processing skills, such as washing, cleaning, and roasting natural tea. Her tea is now packaged, displayed, and sold at the center. She is delighted with her new work and the income it provides (Figure 10).

Similarly, Ms. Sunan Khuenkaew, a farmer in Chiang Muan District, managed to eliminate debt after training at the center and adopting sustainable agriculture with self-reliance practices. Within approximately six years, she was able to repay about 1 million THB of debt. She and her husband now grow vegetables, herbs, and rice, primarily for their own consumption and selling the surplus. Their main income (about two-thirds of the total) comes from raising cattle, which normally generates about 100,000 Baht annually. Moreover, they can sell about 3-5 tons of cattle manure at 3,000 Baht per ton annually, while about 30% is from crop production.

Additionally, they switched to low-input-cost methods such as stopping the purchase of animal feed and creating their feed from their own resources. They manage to grow pasture and make animal feed from other crops on their farm, such as maize cobs, Napier grass, rice bran, and others, including compost from the cattle manure and crop residues (Figure 11). Due to relying on family labor, these activities make them spend most of their time on their farm. However, these self-reliance practices enable a decrease from 50-60% to 15-20% of farm input costs by the circular maximized utilization of raw materials. It not only provides a sustainable and higher income but also enables them to pay off debt. It also results in healthy and better crop and livestock productivity, improving the soil, reducing carbon emissions, and creating a friendly environment for a healthy and happy family.

**Figure 10:**

Tea roasting by Ms. Yupin – the Hmong hill tribe woman, and her products packaged and sold at the center.



**Figure 11:**  
(Left) Cow rearing, the major income source of Ms. Sunan, and (Right) Cutting maize stems to prepare cow feed.



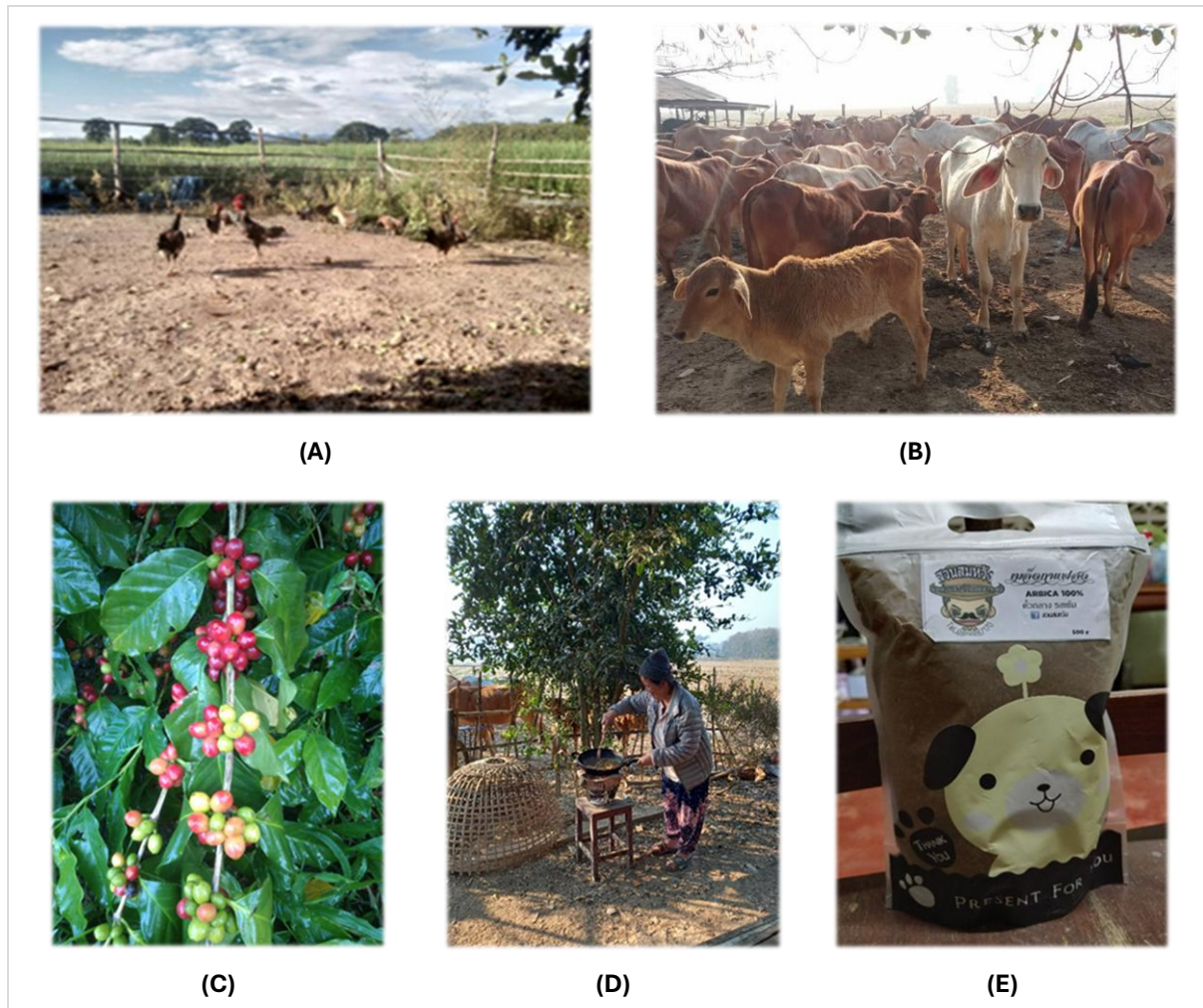
Another successful story is that of Mrs. Natha Thamee and her husband, farmers in the Mae Jai District of Phayao. They previously had incurred significant debt due to their practice of conventional agriculture of maize monocropping. They were able to pay off a 1.6 million Baht debt in six years after adopting an alternative to practice integrated farming by transitioning to sustainable agriculture with self-reliance practices.

Today, they have a sufficient income from cattle, fruits, herbs, etc., coupled with a year-round supply of chemical-free food from chicken, eggs, vegetables, and rice. The main income from their cattle isn't only cash but also manure, which they can sell or use to produce compost. It has been a significant aid in improving their farm soil without the costs of chemical fertilizer while reducing carbon emissions. Additionally, Mrs. Natha employs skills learned during her training for value addition, such as roasting coffee, packaging, and selling (Figure 12).

Although these activities keep Mrs. Natha and her husband busy all year round, they are satisfied and happy with the return. They earn about 350,000 – 400,000 Baht annually from cattle plus about 30,000 Baht from selling 10 tons of manure. Moreover, natural coffee provides about 40,000 Baht per year. The activities are mostly carried out by family labour, so the input cost is low (10% of the income). Household expenses are also minimal due to the consumption of mostly farm products. Living in this situation of no debt and good health due to a friendly environment with food security and safety and regular income, Mrs. Natha said: *"We don't think we could be any happier than this."*

**Figure 12:**

(A) Chicken and paddy, mainly for home consumption; (B) Cattle – a major source of income and compost; (C) Coffee plant; (D) Simple roasted coffee; and (E) Roasted and ground coffee for sale.



#### 1.4 Conclusion

The center's main goal is to raise awareness about the importance of sustainable farming and self-reliance among small-scale farmers, many of whom are still trapped in a circle of debt. The center's practices have proven successful in improving home economies, establishing food security and safety, adding value to agricultural products, and promoting a healthy lifestyle and environment. The Center's training and capacity-building programs demonstrate that farmers can successfully and profitably implement CSA practices if they are willing to adapt.



## 2. Integrated Organic Farming at the Learning Centre of Mr. Jamnong Nackpradub

*Ban Toon Subdistrict, Mueang District, Phayao Province*

### 2.1 Background

The integrated organic farming at the learning center of Mr. Jamnong Nackpradub is an inspiring story. *"I am very content with my current situation, working on my small farm and having a loving family. It is completely different from my troubled past,"* said Mr. Jamnong Nackpradub, a 64-year-old farmer in Ban Toon Subdistrict, Muang District, Phayao Province, who owns and cultivates a 3.5 rai intensive farm.

Mr. Jamnong was not always a farmer; he used to work with a media agency in Bangkok. Despite his appreciation and enjoyment of that business, he had to stop due to the economic crisis in 1997. He and his wife then decided to return home and start a small-scale at-home farm, following the "New Theory of King Rama IX" - the sufficiency economy principles of self-reliance practices.

Due to their lack of experience in farming, the initial attempts at rice and mushroom cultivation, as well as frog raising, did not yield good results. But Mr. Jamnong was not discouraged by this outcome. He spent several years learning more by attending various training courses, acquiring information from related agencies, and researching various information sources. The real improvement came after he trained with the Land Development Station in Phayao in 2002. This training made him recognize the importance of soil improvement and land use planning.

### 2.2 Turning Point

Mr. Jamnong commenced improving farm soil quality by producing and applying compost. Considering environmental and health concerns, all materials used were biomaterials from his farm (Figure 13).

He proudly said that the turning point to sustainable agriculture was *"the collapse of his business due to the economic crisis and the desire to ensure the health and safety of his beloved family members on their own land."*

**Figure 13:**  
Making compost from biomaterials.



With the successful results, they stopped applying chemical inputs in 2003. By continuously improving the soil with compost, it took 5-6 years for the soil to gradually become sufficiently fertile to sustain crop production without the use of chemical fertilizers.

Mr. Jamnong conducts land use planning according to soil quality and market demand. His 3.5 rai of land has been designed to accommodate various vegetables, strawberries, and fruits. All farming practices are based on the principles of organic farming. A good land use plan, combined with crop characteristics, allows for secure year-round production and income (Figure 14).

**Figure 14:**  
Planting different vegetables at different times of the year.



The other portion of the land is used for strawberries and a mixture of fruits, including mango, rambutan, guava, mangosteen, and jackfruit. The rambutans from this farm have a good taste and texture. *"It's wonderful that rambutan is available in the north. The quality can compete with those from the east and south,"* said Dr. Nathsuda Pumijumnong, team leader of the project (Figure 15).

The organic strawberries are well-known locally, and customers can pick fresh strawberries from the farm. Due to the customers' preference for organic products, they come to buy fresh fruits at the farm. Mr. Jamnong's wife handles sales (Figure 16 and Figure 17).

**Figure 15:**  
(A) Strawberry farming plot; (B) Mixed fruit plantation; and (C) Rambutan plantation.



(A)



(B)



(C)

**Figure 16:**  
Picking strawberries from the farm.



**Figure 17:**  
(A) Guavas; (B) Santols; and (C) Selling rambutan at the farm.



Mr. Jamnong and his wife harvest fresh vegetables to sell at Phayao Hospital twice a week. With a good plan for cultivation and marketing, they can supply vegetables to the customers at the hospital and other places year-round (Figure 18).

*"I am very satisfied with his vegetables. They are fresh, safe, and very convenient to buy. We are happy to have organic vegetables for our staff and patients",* said Ms. Kanika, a staff member at Phayao Hospital.

With the success of soil improvement and organic farming practices, his farm is promoted to be the learning center of the Land Development Department. He then passes on his knowledge to many other farmers. Many of them have followed his practices (Figure 19).

**Figure 18:**  
 (Above) Vegetables sold at Phayao Hospital, and (Below) Ms. Kanika, a regular customer at the hospital market.



**Figure 19:**  
 (Above) The learning center at Mr. Jamnong’s farm, and (Below) Training farmers on land use planning.





**Figure 20:**  
Ms. Supaporn Phayayam.

### 2.3 Success Stories

One of the trainees, Mrs. Supaporn Phayayam (Figure 20), a 62-year-old farmer from Village 2, Ban Toon Subdistrict, Muang District, Phayao Province, has been a vegetable grower since she was young. She has intensively cultivated cabbage, cauliflower, chili, etc., on 0.5 rai of land. After training in 2016, she started to make compost fertilizer and bio-extract from local resources and applied them to her garden. No more chemicals have been used since then.

*"I am happy with the situation now," said Mrs. Supaporn. "With organic practice, my expenses are much lower due to not purchasing chemical fertilizer, while I receive double the price for vegetables. I can sell all the vegetables of each*

*harvest with nothing left over because the customers like the products. Some come to buy at my place, and I also sell them at the local market."*

Mr. Jamnong does not work alone. His wife fully supports him. Apart from housework, which is usually done by women, she also works on the farm with her husband. Both of them spend their time mostly on farming activities. The improved soil results in good organic productivity of vegetables and fruits. This and the high demand for organic products eliminate marketing problems. Vegetables contribute to a regular income of 10,000 – 15,000 Baht per month. The sale of fruits usually generates about 50,000 – 80,000 Baht per year by season. Moreover, Mr. Jamnong gets an honorarium for occasionally being a resource person for the Land Development Department. Its amount is about 5% of total income.

The diverse cultivation results in biological pest control. Therefore, no pesticides are used on their farm. Elimination of chemical fertilization makes farm investment costs much lower. The investment cost has been reduced to about 10 % of the crop revenue. Furthermore, carbon emissions have also been reduced. All these results allow the couple to have a happy life and healthy family by living in a safe environment with food and occupational security.

**Figure 21:**  
Mr. Jamnong and his wife working in the strawberry plantation plot.



## 2.4 Conclusion

In conclusion, soil improvement and careful land use planning are key to the success of this case. The good products produced at different times of the year reflect no market problem, which is a typical problem for most farmers.



## 3. Good Agricultural Practices of Pumpkin

*Bua Yai Subdistrict, Na Noi District, Nan Province*

### 3.1 Background

Ms. Vanrien Tuinoi, a 60-year-old farmer from Village 1, Bua Yai Subdistrict, Na Noi District, Nan Province, has spent over 30 years, alongside her husband, cultivating maize on 25 rai of land. Like many farmers in the area, conventional practice led them to rely heavily on chemicals for cultivation.

### 3.2 Turning Point

Their outlook changed in 2019 when they decided to stop using toxic chemicals, which threatened their health and the environment and caused high input costs.

That year, they diversified from monocropping maize to an alternative of mixed crops, including pumpkins, vegetables, and rubber. They allocated 7 rai in the lowland for pumpkins while the rest were for rubber. Initially, they cultivated seven rai of pumpkins with chemical fertilizers. However, the first year saw a paltry return due to the low price of only 2 Baht/kg. After accounting for production costs, they earned only 3,604 Baht, which was much lower than the yield from maize (approximately 1/8 of the earnings).

In 2020, they learned that they could sell pumpkins for up to 10-13 Baht/kg if they avoided using chemicals and joined the "Community Organic Agriculture Enterprise of Bua Yai" (Figure 22). After switching to the organic practice, they found that the input cost of pumpkin cultivation using organic fertilizer was much lower than maize cultivation for the same

land area. The land preparation cost remained the same, but the cost of fertilizer and seeds was significantly lower. They also saved on herbicide costs and labor costs for planting and harvesting, as they utilized their family labor for these tasks. Moreover, pumpkin cultivation didn't require as much water as other vegetables or rice.

Learning by doing, they found that they could adjust the time to cultivate 2 cycles of crop cultivation in the same plot of land. They grew kale and pea eggplant before the pumpkins. However, only 1 rai of vegetables can be managed due to the intensive care required with organic practice. Otherwise, their pumpkin cannot get the organic guarantee. This practice also results in the reduction of carbon emissions.

**Figure 22:**

The Community Organic Agriculture Enterprise of Bua Yai.



The family shares the necessary labor for vegetables and pumpkin production. The husband takes on the strenuous land preparation while both collaborate on other activities (Figure 233). With these practices, they could sell vegetables and pumpkins at a good price. Kale and eggplant are sold easily in the domestic market of Bua Yai and Na Noi or sometimes in the enterprise. Pumpkin is sold mainly to the enterprise at a good price. It earns the "Good Agricultural Practice - GAP" certification with "Participatory Guarantee System - PGS<sup>14</sup>".

Her pumpkins are transported and sold at the collecting center of the "Community Organic Agriculture Enterprise of Bua Yai" in Village 8. This center collects GAP-PGS and organic pumpkins from other farmers in Bua Yai and throughout the Nan province.

GAP-PGS pumpkins are also sold domestically at a small shop in Bua Yai and alongside other products at the organic market in Na Noi District, which operates twice a week, every Tuesday and Friday (Figure 24). The demand for vegetables is mainly in the community and the organic market in Na Noi District, so there are no problems with selling.

**Figure 23:**

(Left) Ms. Vanrien's husband preparing land for seedlings, and (Right) Ms. Vanrien working in her pumpkin plot.



<sup>14</sup> Participatory Guarantee Systems (PGS) are locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange.

The couple spends their time cultivating vegetables, pumpkin, and rubber, which keeps them busy nearly all year round. The exception is in the slack season during a few months in the summer<sup>15</sup>. Hence, their major income is from vegetables and pumpkins, as the rubber plantation has not yielded yet. They receive a small amount of money from time to time from their daughter, who is working in Bangkok.

Nowadays, they are happy and satisfied with alternative organic cultivation, mainly from pumpkins and some vegetables. The margin from these crops is nearly 5 times higher than maize, while the input cost is only half (Table 1).

**Table 1:**  
Comparison between the Practice of Conventional Maize Cultivation and Organic Vegetables and Pumpkin.

Crop/Cost/Return	Maize	Inorganic Pumpkin (year 2019)	Organic Practice (year 2020)		
			Kale & eggplant	Pumpkin	Total
Farm size (rai)	7	7	7		
- Seed	6,048	4,140	1,200	4,140	5,340
- Herbicide	1,512				
- Fertilizer	6,020	1,300	300	1,050	1,350
- Ploughing	3,500	3,500		3,500	3,500
- Planting	2,744				0
- Weed control		1,200	1,200	1,200	2,400
- Harvesting	7,000				0
- Fuel for water pump		756		756	756
- Transportation	840	1,000		500	500
<b>Total Cost (Baht)</b>	<b>27,664</b>	<b>12,396</b>	<b>2,700</b>	<b>11,146</b>	<b>13,846</b>
<b>Return (Baht)</b>	<b>56,000</b>	<b>16,000</b>	<b>20,400</b>	<b>130,000</b>	<b>150,400</b>
<b>Margin (Baht)</b>	<b>28,336</b>	<b>3,604</b>	<b>17,700</b>	<b>118,354</b>	<b>136,054</b>

"I am very satisfied with practicing GAP-PGS pumpkin cultivation, and we are transitioning to organic pumpkin cultivation," said Ms. Vanrien. "The cultivation process isn't complicated, and pumpkins don't require much water. We can secure a good price with much lower input costs. Sales at the collecting center is convenient as it is close to our location. This practice enables us to preserve our health and environment while yielding a good return."

<sup>15</sup> During March to mid May, the same as other farmers in Bua Yai

**Figure 24:**

(A) Transporting pumpkins to the collection center; (B) Pumpkin pile at the collection center; (C) Transporting pumpkins from areas outside of Bua Yai; (D) Ms. Vanrien and her certified pumpkins; (E) Pumpkin sale at Bua Yai; and (F) Selling pumpkins and other vegetables at a local market in Na Noi.



(A)



(B)



(C)



(D)



(E)



(F)

The collecting center is managed by Mrs. Thikamporn Kongsorn. She is a villager from Village 8 and the chairperson of the Community Organic Agriculture Enterprise of Bua Yai. She has made substantial efforts to manage the pumpkin market and enhance its value. She has worked extensively with local institutes, government agencies, and the private sector to develop fresh and processed pumpkin forms, arrange for certification, and manage marketing (Figure 25 and Figure 26). Collaborating with CP, the certified pumpkins are sold at the Makro Supermarket in Bangkok.

The group operates processing facilities at Village 8, supported by the Central Group's private enterprise. With an oversupply of pumpkins during the season, Thikamporn, in conjunction with local institutes, has worked to develop additional value-added products. These products include cake, crispy pumpkin, powder, seed oil, toffee, and a blend with ground coffee. Apart from local sales, these products are also sold online and displayed at various exhibition booths in Bangkok (Figure 27 and Figure 28).



**Figure 25:**  
Mrs. Thikamporn Kongsorn.

*"I am happy that I can help some villagers reduce or even eliminate the use of chemicals, which pose a danger to the soil, water, climate, and health. The benefits are not only at the family level but also extend to the community and globally," Mrs. Thikamporn said.*

### 3.3 Conclusion

In conclusion, people are increasingly aware of the danger posed by using chemicals in agriculture, which harms health, natural resources, and the environment. However, transitioning to "Good Agricultural Practices" requires support, especially for marketing and value addition along the chain.



**Figure 26:**  
Mrs. Thikamporn Kongsorn, women group representative for Bua Yai Subdistrict.

**Figure 27:**

(A) Pumpkin with organic certification; (B) Device to make pumpkin paste (C) Selling pumpkins at Makro Supermarket; (D) Processing facilities supported by Central Group; and (E), (F) Pumpkin cakes on sale.



(A)



(B)



(C)



(D)



(E)



(F)

**Figure 28:**

(A) Pumpkin cookies; (B) Crispy pumpkin; (C) Pumpkin powder; (D) Pumpkin toffee; (E) Coffee-infused pumpkin seeds; and (F) Pumpkin seed oil.



(A)



(B)



(C)



(D)



(E)



(F)

## 4. Sesame – Crops for the Elderly

*Bua Yai Subdistrict, Na Noi District, Nan Province*

### 4.1 Background

Thailand, like many other countries, is facing the challenge of an aging farming population as younger people migrate to urban areas for employment, leaving their elderly parents in rural areas. This pattern is also evident in Bua Yai.

### 4.2 Turning Point

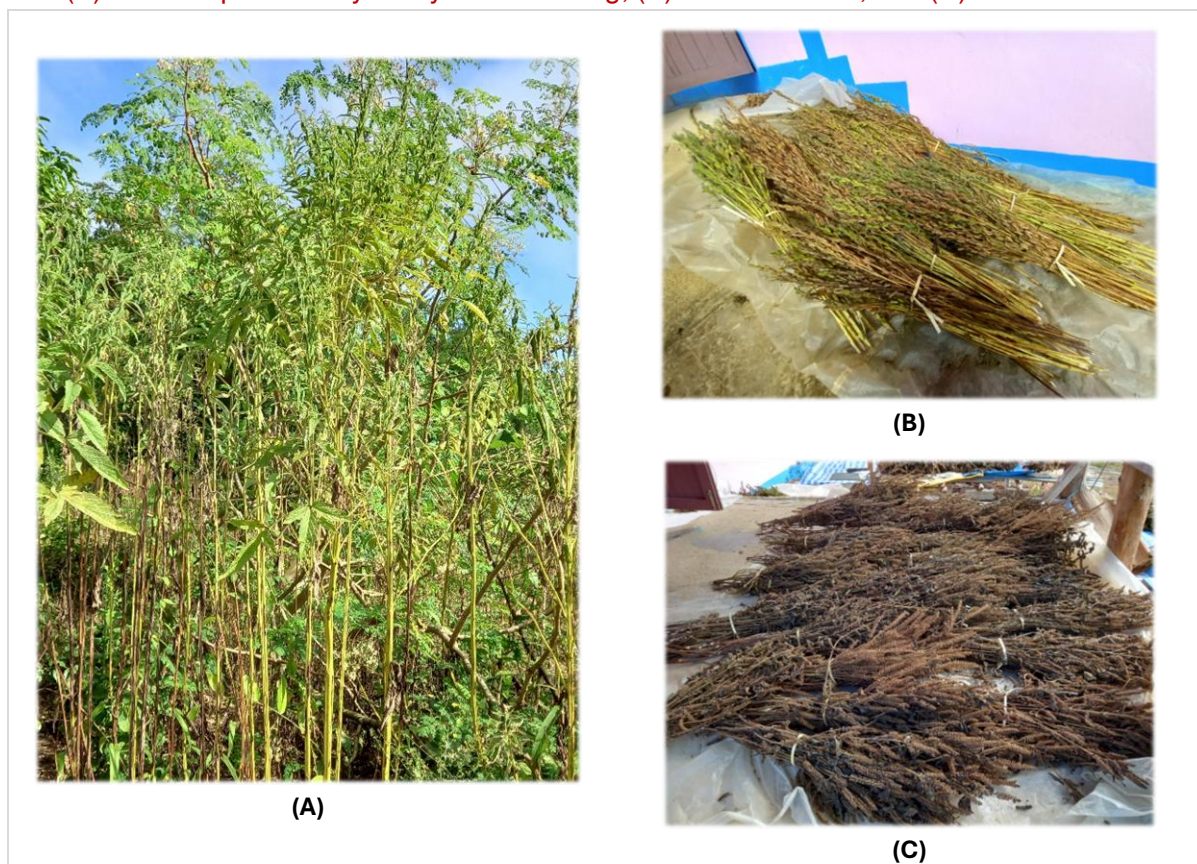
Mrs. Boonnong Kamolsilp, a 67-year-old resident of Village 2, Bua Yai Subdistrict, Na Noi District, Nan Province, has lived alone since her husband passed away ten years ago. Her child had been working in Bangkok. Despite owning 300 productive para-rubber trees, she had not been tapping rubber due to the constraints of her age. She had allowed others to tap on her rubber and share 50% of the sale, which had been her main source of income. Other income sources were small amounts from being employed for housework of others and remittance of her child.

In 2020, she started to have a supplementary occupation by growing sesame on 0.5 rai of land. She was drawn to this alternative by its good market, easy cultivation, which doesn't demand much labor - making it suitable for the elderly - and its drought resistance. She grows a mix of black and white sesame and Perilla in the same plot. The cultivation process is straightforward as it doesn't require any land preparation. She applies herbicide in May, broadcasts in June when the rains arrive, and adds manure later. Each activity takes only an hour, after which she waits for the harvest (Figure 29).

Sesame is an annual crop with a lifetime of about 4.5 months, meaning the harvest season is in late October. After the harvest, the crop is left to sundry. After 3-5 days, Mrs. Boonnong threshes the crop, separating the pods from the sesame grain. The residues are returned to the field to serve as green manure.



**Figure 29:**  
 (A) Sesame plant nearly ready for harvesting; (B) White sesame; and (C) Black sesame.



Packing is also simple. Mrs. Boonnong weighs the grain and places it into a plastic bag. She grows three products: black sesame, white sesame, and Perilla (Figure 29 and Figure 30–A). As her production is much lower than the demand in Bua Yai, her products are sold out quickly. The price of sesame was 100 Baht /kg while 200 Baht/kg of Perilla.

Her practice doesn't require engine use for plowing or chemical fertilizer use. She uses animal and green manure with manual harvesting and threshing, making it an environmentally friendly product with low carbon emissions. Moreover, she can earn extra from regular income of tapping sharing, about 100,000 Baht annually. The extra return from sesame planted in a small area of 0.5 rai at the homestead in 2022 was about 3,200 Baht, while only 200 Baht was needed for herbicide and labor input. This success satisfied Mrs. Boonnong, and she encouraged several farmers in Bua Yai to cultivate sesame in 2023.

**Figure 30:**

(A) Threshing the sesame; (B) White sesame grains; (C) Weighing the grains; and (D) Sesame seeds packaged and ready for sale.



"I am happy with growing sesame," says Mrs. Boonnong. "The cultivation is easy and simple, well-suited for the elderly. I can work on my own without the need to hire additional labor and at very low input costs. The dry spells do not harm sesame. There is no market problem; villagers come to buy sesame at home. I will continue doing this until I am too old and can't work anymore".

Similarly, Mr. Art Sinrat, a 72-year-old neighbor of Mrs. Boonnong, has been growing sesame for 10 years. He stated, "It is a simple cultivation crop which requires very low input cost and does not cause much harm due to minimal chemical use."

Mr. Art applies herbicide in May, prepares seedlings, and transplants them in June, then waits for the harvest in early November. He carries out these activities alone, as they are not time-consuming or heavy workload. Unlike Mrs. Boonnong, Mr. Art keeps his sesame for home consumption and doesn't sell it (Figure 31–B).

"I prefer to work on something at this age, not just stay idle. Sesame is quite suitable for the elderly. Moreover, this crop is resilient to drought and unexpected rain during the harvesting period. The hair on the pod protects the moisture, preventing damage to the grain," says Mr. Art.

**Figure 31:**  
(A) Mrs. Boonnong and (B) Mr. Art, both content with working on sesame cultivation at an advanced age.



### 4.3 Conclusion

In conclusion, the sesame cultivation practices of these two farmers highlight the suitability of this crop for the growing population of aging farmers in society. The resilience of this crop to dry spells and unexpected rain at harvesting time points to its adaptability in the face of climate change. Avoiding the use of machinery and minimizing chemical use results in environmentally friendly farming, which also reduces carbon emissions.

## 5. Beekeeping

*Bua Yai Subdistrict, Na Noi District, Nan Province*

### 5.1 Background

People worldwide have known and consumed honey as a healthy food and traditional medicine for thousands of years. Similarly, the primary use of honey in Thailand since ancient times has been for folk medicine and food preservation. In the past, Thai people obtained honey through wild bee hunting in the forests, as the country was abundant in bee flora and home to several honeybee species. Beekeeping was introduced for academic purposes at Chulalongkorn and Kasetsart Universities in 1940. However, the initial attempts were unsuccessful, and the situation only improved with Taiwanese experts' assistance and knowledge sharing.

Today, both traditional honeybee hunting and beekeeping play crucial roles in the economic and spiritual lives of Thai people. They contribute to additional income generation and increase crops, fruit, and vegetable production through cross-pollination, enhancing ecological security in rural communities. Beekeeping has become a popular occupation among Thai farmers. It is practiced throughout the country, including Bua Yai, Na Noi, and Nan.

### 5.2 Turning Point

In Bua Yai, the surrounding areas are still rich in wild flora. The community and reserve forests can be used and managed for economic prosperity without severe environmental implications, prompting many farmers to start beekeeping, especially in recent years. The villagers in Bua Yai primarily adopt this alternative to supplement the main occupation of agriculture. Beekeeping in Bua Yai is primarily carried out by family members. Due to limited workforce availability, each

family manages several bee boxes around their houses and plantations. Some individuals received training from experts, while others learned from observing nature.

**Figure 32:**  
Mr. Nattachai and his small apiary.



For instance, Mr. Nattachai, from Village 2 in Bua Yai, owns 35 rai of land comprising 30 rai of rubber plantation and 5 rai of a variety of medical herbs such as lemon grass, Curcuma, and Bengal root. He realized he could start beekeeping without harming his existing crop cultivations, which he and his wife operated.

After observing an abundance of wild bees in Bua Yai, he attended a beekeeping training program in Phayao province in northern Thailand.

He began to have this venture in 2021 (Figure 32). He initially purchased three bee boxes from Phayao, costing 450 Baht each. Later, he began making bee boxes himself, using easily available wood from Bua Yai. Currently, he and his wife take care of 25 bee boxes.

Mr. Waen Thapumintr, a beekeeper from Village 2 of Bua Yai, learned beekeeping from observing the bees' behavior around his property and started in 2013 (Figure 33). He made bee boxes from the wood sourced from his property. Mr. Waen, Mr. Nattachai, and other beekeepers in Bua Yai have the same simple practices.

**Figure 33:**

Mr. Waen places a beehive under his small rice barn.



**Figure 34:**

Honey produced at Mr. Nattachai's apiary.



They let the wild bees fly in the box around late December, using pheromones to stimulate them (Figure 35—top left). The bees then create hives while flying out to collect nectar (Figure 35—top right and bottom right) and turn it into honey. The harvesting time is in April, before the hot season. Farmers collect raw honey straight from beehives and pass it through a very thin cloth to remove debris and wax. Honey product marketing is simple, mostly direct sales to friends or people whom farmers know.

In 2023, Nattachai and his wife could collect about 70 bottles of raw honey and honeycomb. They stored them at home (Figure 34 and Figure 35—bottom left). Some are direct sales to customers who know him, while some volumes are sent to his daughter, who works in Phichit province and sells there. They earned about 15,000 Baht from these products. This is an extra income on top of the 25 rai of rubber and medical herbs. Rubber normally generates about 200,000 Baht, while about 15,000 Baht is generated from herbs annually.

Mr. Waen has adopted this alternative to supplement the major occupation of 25 rai of rubber plantation, operated by his wife and himself. He realized that despite being a beekeeper, he still could work on rubber as usual. He made bee boxes from the wood sourced from his property. His 20 bee boxes are distributed in the home garden and the rubber plantation. In 2023, he earned about 20,000 Baht from raw honey and honeycomb, on top of about 170,000 Baht

margin from rubber. He has noticed that beekeeping helps to enlarge the bee population as the bee larvae are still alive and propagate instead of being killed by honeybee hunting.

**Figure 35:**

(Top left) Beehive with bees; (bottom left) products stored at Mr. Nattachai's home; (top right) bees collecting nectar from wildflowers; and (bottom right) source of wildflowers in the forest.



The couple has one daughter living with them. Despite working at the essential oil plant in the same village, she helps the parents to create labels. The labels describe the source, usage, and production place, including the contact number (Figure 36—middle right and bottom right). Besides direct sales to customers they know, the products are also sent to the other daughter, who works in Chiang Mai and sells the honey there. The daughter also creates a market via social media by promoting and updating on her Facebook.

Currently, there are about 30 beekeepers in Bua Yai who have joined together and formulated the "Community Wild Bee Loving Enterprise of Bua Yai." Apart from selling the product, they sometimes display and sell together at events such as nearby organic markets (Figure 36—top right and bottom right). The major problems of beekeeping here are the decline of honey product prices due to increased beekeepers, which results in a larger supply volume, and predators such as lizards and wasps. However, farmers still have a satisfactory return from beekeeping with no harm from chemical uses. They would like technical support on the value chain of products, as well as marketing and pest control.

**Figure 36:**

(Left) Honey on display at organic market in Bua Yai; (top right) Honey products on display and sale at organic market at Bua Yai Subdistrict Administrative Organization; (middle right) label created by Mr. Waen's daughter; and (bottom right) placing the labels on honey bottles.



### 5.3 Approach to Sustainable Beekeeping

In response to the farmers' needs, the TA team, in consultation with the community, beekeeper leader, and Nan Community College to conduct the training workshop with a focus on the practical aspects of processing honey products in different forms, biological pest control, marketing channels, and more. Additionally, this local institute plans to develop an associated work plan in collaboration with the Bua Yai beekeeping group for the future.

### 5.4 Conclusion

Beekeeping is a viable alternative livelihood for farmers surrounded by a diverse forest and environment. This supplementary occupation helps them generate more income while maintaining natural resources with no negative impacts from chemicals and no carbon emissions. Moreover, this practice supports natural bee propagation and enlarges the wild bee population.

## 6. Traditional Weaving

*Bua Yai Subdistrict, Na Noi District, Nan Province*

### 6.1 Background

The Baan Nong Ha Women Weaving Group is in Village 8, Bua Yai Subdistrict, Na Noi District of Nan Province (Figure 37). The group is led by Mrs. Sai-ngern Kaewkantha, a 58-year-old resident of Village 8. Mrs. Sai-ngern plays a crucial role in overseeing the group's technical and marketing aspects (Figure 38).

Over half of the Baan Nong Ha Women Weaving Group members work together at the weaving center. The center was constructed by village men using locally sourced timber from the community forest. The group's focus on village-based weaving reflects a long-standing tradition

passed down through generations. The locally produced clothes

are made the same way they have been for centuries, with the addition of knowledge provided by the Nan Community Village. The handwoven cloth produced at the center is used to create various products, including clothing for women and men, scarves, blankets, shawls, and bags (Figure 39).

The group uses foot-looms made from local woods, constructed by village men with indigenous knowledge (Figure 39-bottom right). The group uses both synthetic yarn and natural cotton for weaving. While only a few families grow cotton and spin it themselves, most of the yarn

**Figure 37:**  
Baan Nong Ha Women Weaving Group.



**Figure 38:**  
Mrs. Sai-ngern Kaewkantha, chairperson of the group.





is synthetic and purchased from Nan. All yarns are dyed using local plants that grow naturally. For example, coconut fiber and siew flower-*Bauhinia malabarica* produce a light brown color, while Paduak bark-*Pterocarpus indicus* produces a dark brown color, *Maklue bark-Diospyros mollis* produces a blue color, and mango leaves produce a yellowish-green color. Based on their experiences, one plant can produce four color shades (Figure 39–bottom left).

**Figure 39:**  
(Top left and top right) Clothing for women and men, and shawls; (bottom left) dyed yarn from local plants; and (bottom right) simple foot loom made by the village men.



## 6.2 Turning Point

The Baan Nong Ha Women Weaving Group members are happy to work at the center because it generates additional household income and provides an opportunity to spend time with friends while working. The group weaves between 10 a.m. and 4 p.m., after finishing housework and before preparing food. The group comprises about 80 members, including elderly women who have retired from agriculture activities and agriculturist women who have free time after the harvest. According to the chairperson of the group - Mrs. Sai-ngern, full-time weavers who do not work on farms earn about 2,000-5,000 Baht per month, depending on the design, while part-time weavers earn about 15,000-20,000 Baht per year.

### 6.3 Beneficiaries

Mrs. Sai-ngern Kaewkantha, the group's chairperson, visits the center almost daily. She owns 35 rai of land, comprising 20 rai of maize and 15 rai of rubber plantation. As being alone and agriculture is heavy for women, she partly works on a farm by managing to harvest maize herself. She employs workers to tap rubber and has the alternative of weaving. In addition to the indigenous skills obtained from her mother, she has learned and practiced more. She usually produces about 3-4 pieces of cloth per month of the northern classical design of Pha Lai Nam Lai - watermark flow (Figure 40). Her earnings are from 2 sources: agriculture and weaving. Maize and rubber generate about 140,000 Baht, while 50,000 Baht is generated annually from weaving.

**Figure 40:**  
Pha Lai Nam Lai - Watermark Flow – the Classical Northern Design, by Mrs. Sai-ngern.



**Figure 41:**  
Pha Lai Nam Lai - Watermark Flow, by Mrs. Pongkham.



Pongkham Tuinoi, age 75, also lives alone in Village 8. Her two children are away; one works abroad, while the other is in Bangkok. She uses her indigenous skills and additional knowledge to produce two pieces of Pha Lai Nam Lai per month. That means she can generate about 2,500 Baht per month, on top of about 10,000 Baht monthly remittance from the children. For her, it is much better to work at the center than to do nothing and be lonely at home. She walks to the center every day (Figure 41).

Mrs. Porn Inja, age 67, from Village 8, started doing part-time weaving in 1999 and became a full-time weaver a few years ago (Figure 42). She and her husband used to do farm work but passed it on to their children, who now care for them. Instead of doing nothing at home, she has taken up weaving. Despite already having this skill, she is happy to join the Baan Nong Ha Women Weaving Group as it allows her to learn more. With technical assistance from Nan Community College, she can produce woven cloth with the "Sao Din" design - a well-known tourism site in Na Noi District, Nan Province. She earns about 2,000 Baht net per month through weaving.

Mrs. Jamnien Inja, age 68, from Village 8, and her sister grow cotton on a small piece of land. They cultivate, maintain, harvest, and spin the cotton themselves. They do not dye cotton but instead maintain their natural color. Due to age constraints on farm work, she and her husband hire neighbors to work on their 15 rai rubber plantations. They earn about 3,000 Baht per year together with consideration remittance from the children working away. She is very happy with the additional earnings of about 3,000 Baht per month from weaving in addition to the rental fee and remittance. Moreover, she enjoys spending time with friends at the center (Figure 43).

**Figure 42:**  
Mrs. Porn weaving a “Sao Din” Design.



**Figure 43:**  
(Top) Mrs. Somthawin setting the yarn; (bottom left) Mrs. Jamnien weaving with natural cotton and natural colors; and (bottom right) ready-made shawls by Mrs. Somthawin.



Mrs. Somthawin Mahathanajaroen, age 54, and her husband work mainly in agriculture while the children are away. They own 42 rai of land, comprising 30 rai of maize and 12 rai of rubber plantation. The couple manages the farm by themselves while the children work in Bangkok. Farm activities keep them busy all year round, with the peak harvesting period between late October and late December. However, Mrs. Somthawin can join the weaving group during the non-peak period. Based on her indigenous knowledge, she produces about 5-6 pieces of shawls. At the price of about 250 Baht per piece, she is able to earn about 12,000 Baht annually. This amount supplements the major occupation of maize and rubber cultivation, which usually generates about 125,000 Baht annually. She is very happy with this handicraft, which she says gives her a much better life than working in Bangkok in the past (Error! Reference s

ource not found.).

## 6.4 Conclusion

These stories clearly show that elderly women can earn extra income while enjoying their time by joining a weaving group. The empowerment of indigenous knowledge and technical assistance improves their overall well-being, which ensures their productivity through their older years. Handmade weaving without the use of an engine reflects friendly environmental activities without carbon emissions. Hence, this practice should be disseminated to other rural societies.

## 7. Conclusion

The stories illustrate the endeavors of small-scale farmers and women in the highlands of two northern Thai provinces – Phayao and Nan. The stories illustrate how farmers and communities have successfully transitioned from traditional farming to sustainable agriculture. The stories also illustrate individual and social benefits from the careful and balanced use of local natural resources. Weaving represents an important example of an alternative livelihood for the elderly and women’s empowerment through indigenous knowledge and culture. The key to their success lies in several factors: awareness, patience, necessary support, and gender responsibility.

The decision to switch to sustainable farming in the two cases from Phayao and one from Nan signifies the farmers' "awareness" of the detrimental effects of harmful chemicals on the health of the community, the environment, and the local economy. These farmers abandoned traditional farming methods favoring organic practices, leading to increased earnings, improved living environment, and reduced carbon emissions. The two Phayao cases also reveal the added benefits of food safety and household-level food security, which rescued families during the COVID-19 pandemic. They have proven effective in addressing significant challenges, such as being trapped in a cycle of debt and marketing issues, which are widespread among farmers in Thailand. Therefore, disseminating these successful cases would be highly beneficial when applied to farmers and communities in Nan and the highlands. Such efforts can significantly improve the quality of life for highland families and communities, encompassing economic aspects, environmental considerations, food safety, food security, and nutrition, all key elements of CSA practices.

"Patience." Achieving such a transformation required applied and consistent effort and considerable time. While the pumpkin farming case from Nan required only a year-long trial before reaping success, the stories from Phayao describe several years of experiential learning before sustainable agricultural practices could be fully adopted.

“Awareness” also applies to the beekeeping case in Nan, which reflects the necessity to maintain natural resources and sustainably use them, while the weaving case highlights the value of indigenous skills.

However, this success didn't occur spontaneously; success demanded "patience." Achieving such a transformation required applied and consistent effort and considerable time. While the pumpkin farming case from Nan required only a year-long trial before reaping success, the stories from Phayao describe several years of experiential learning before sustainable agricultural practices could be fully adopted.

This transition would not have been possible without “support.” The two cases from Phayao highlight the need for technical support, including awareness campaigns to alter mindsets towards self-reliance and circular utilization of local resources, moving away from reliance on external chemical inputs. Furthermore, they required guidance on sustainable farming practices. The woman trainer in Phayao and Nan, as well as the marketing support in Nan, exemplify the necessity for assistance from public and private sectors, including academic institutes. Similarly, technical and marketing support from both the public and private sectors is necessary for Nan's beekeepers and weaving group.

The sesame farming case in Nan presents a unique perspective. Here, villagers independently identified a crop suitable for the elderly, met market demands, adapted to climate change, and reduced carbon emissions.

All the cases exhibit a “balance of gender roles,” with both genders working cooperatively and supporting each other. Women, in particular, play an active role in sustainable agriculture.

Through the six case studies, each story reveals distinct turning points and transition steps toward implementing Climate-Smart Agriculture (CSA). A common theme of these transitions is the narrative of successful and satisfied individuals. These outcomes are a testament to the altruistic spirit of the people, complemented by support from both public and private sectors, including academic institutions.